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15. ON THE OCCURRENCE OF JUVENILE MACKEREL *RASTRELLIGER CANAGURTA* (CUVIER) OFF GOA COAST

Goa along with the west coast of India has a flourishing mackerel fishery solely, supported by *Rastrelliger canagurta*. Though the small-sized mackerel have been observed elsewhere yet from the Konkan Coast except for isolated records of small-sized mackerel off Karwar (Pradhan 1956) and off Ratnagiri (George & Annigiri 1960) young mackerel below 10 cm length have not, so far, been reported. I collected juvenile mackerels several times during 1964-69. The details are given in the Table. Peter (1969) has reported the occurrence of larvae from Persian Gulf, Red Sea and Bay of Bengal in Indian Ocean (22° 22'N., 60° 50'E., 16° 37'N., 41° 09'E., 18° 15'N., 87° 48'E.) from deeper waters.

The occurrence of 48-70 mm juveniles at Goa in May 1965, indicates that the spawning must have commenced much earlier than June-September as reported by Devanesan & John (1940), whereas Balakrishnan (1957) observed that breeding of mackerel commenced during March-April. George & Annigiri (1960) considered the occurrence of small sized mackerel in September as a result of spawning a few months earlier. Similar inferences can be drawn from five instances in Goa also, as recorded above. Peter (1969) has recorded occurrence of small larvae of mackerel in the Indian Ocean in October-November. This difference in the time of occurrence of larvae and juvenile in earlier

reports may be due to the difference in breeding at far off places from where the larvae were obtained. Nevertheless, some observations at

TABLE
JUVENILE OF *Rastrelliger canagurta* OFF GOA COASTS

Date	Place of collection	Size Range in mm	Mode of collection	Total No. of Juvenile observed	Depth in fathoms
28/ix/64	Panjim	60-90	Purse seine	63	12
3/x/64	Panjim	80-110	-do-	87	8
6/v/65	Calangute	48-70	Trawling	12	10
20/ix/65	Baina	105-140	Purse seine	47	10
14/x/65	Calangute	90-120	-do-	18	10
23/ix/67	Baina	80-110	-do-	35	9
1/vi/68	Baina	58-75	Trawling	18	10
1/vi/69	Calangute	55-75	-do-	9	10

Goa support Balakrishnan (loc. cit.) that spawning probably takes place as early as March.

The mackerel fishery in this area generally commences in September with the appearance of younger size groups varying between 160-200 mm. However, from November onwards the fishery is supported by 220-240 mm groups with mode at 230 mm during January-March. These are mostly with gonads in III stage of maturity. The largest specimen measured during this period was 290 mm in April 1968. During April and May, in all the years of observations, occasionally spent specimens were observed indicating probably termination of spawning. However, in August 1971, some stray specimens of mackerel from Rampan Catches which were in advanced stages of maturity, being V or early VI were observed on this coast. This suggests that mackerel perhaps has a prolonged breeding season with periodic spawning (more than once) during this period. There is need for further detailed investigation to confirm this observation. Plankton collections made during this period in the area do not seem to have eggs showing resemblance to mackerel eggs.

The main season of spawning of the mackerel along Konkan Coast according to Pradhan (1956), is from May to September. A subsidiary spawning season was reported on Mangalore Coast during January and February by George *et al.* (1959). Since the spawners and young mackerel have been obtained from this area at several places though in

small numbers during the course of this study, it indicates that these are, stragglers from the main shoals which probably are not very far from the actual spawning ground. This could be a useful clue towards exploration of the spawning grounds of mackerel. The occurrence of small-sized mackerel from May-September adds strength to the contention that the Indian mackerel may have a prolonged spawning season. No doubt, the occurrence of juveniles and even adult with spent gonads in an area does not always reveal correct picture about spawning grounds and spawning season yet the probability of these grounds being close to the area of occurrence cannot be completely ruled out. Prolonged breeding season with periodic spawning during the season (more than once) indicates the possibility of different races coming into commercial fishery with gonad in different stages of maturity.

Food of juvenile mackerel :

The food of the small-sized mackerels up to 95 mm size as revealed in the gut contents consisted of diatoms, dinophysids, and a few copepods and protozoa. The gut contents of mackerel, between 95-105 mm was mainly post-larvae of fishes, and crustacean larvae, with negligible phytoplanktonic organisms. The feeding intensity was appreciably high. The food of size groups constituting the commercial fishery between 170-230 mm was mainly diatoms like *Consinodiscus*, *Rhizosolenia*, *Biddulphia*, *Planktoneilla*, *Pluerosigma* and *Chaetoceros* sp. The zooplankton constituents of mackerel food, along this coast are forms like calanids, copepods, cladocera and advanced stages of crustacean, and molluscan larvae, tintinnids and dinoflagellates. The feeding intensity of mackerel is generally high from September to March but moderate from April to June. During April-June period fish scales were often found in the stomachs of mackerel caught by purse seines.

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16. THE SOCIAL SPIDER, *STEGODYPHUS SARASINORUM*
KARSCH. FEEDING ON THE LEMON BUTTERFLY,
PAPILIO DEMOLEUS LINN.

The senior author during a visit to Hatta village in Parbhani District found the webs of the Social Spider holding the dead bodies of the adult lemon butterflies *Papilio demoleus* Linn. on orange trees in a citrus garden. Some of the webbed branches were collected and brought to the laboratory where the webs were kept under a bell jar with a piece of cotton swab dipped in chloroform and spiders that emerged out of the web and died were counted and preserved in 70% alcohol. The webs were then cut and the butterflies separated and counted. It was observed that the bigger webs on an average had 58 spiders and the smaller webs 26 spiders, living almost in the heart of the web. On an average 18 and 8 adult lemon butterflies were collected from the bigger and small webs respectively. The abdomen of the butterflies were completely eaten.

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